FOOTWEAR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to footwear that can absorb an impact on a foot during walking.

2. Description of the Related Art

An exemplary conventional shoe includes an upper leather 501 and a shoe sole 502 that is separate from the upper leather 501. In the shoe sole 502, a shock absorber 503 such as a sponge is provided, as shown in Fig. 6, (see Japanese Patent Laid-Open Publication No. 2002-85108, and Japanese Utility-Model Laid-Open Publications Nos. Hei 6-7506 and Hei 6-77506). In this structure, the shock absorber 503 within the shoe sole absorbs an impact on a foot when the foot comes into contact with the ground during walking, thereby reducing a burden on the foot.

However, because the shoe is formed by two parts, i.e., the shoe sole 502 formed by an outer sole, a midsole, and the like, and the upper leather 501 bonded to the shoe sole 502 to enclose the instep of the foot, the shoe sole 502 cannot easily follow the movement of the foot during walking. Therefore, it is hard for the aforementioned structure to efficiently absorb an impact on the foot.

More specifically, during walking, the shoe changes its shape because of the movement of the foot. Thus, the shoe sole

502 cannot easily follow the movement of the foot while fitting the sole of the foot. Therefore, the shock absorber 503 provided within the shoe sole 502 cannot sufficiently absorb an impact on the foot.

Especially, in shoes with heels, such as a pair of pumps, the center of gravity moves toward a toe. Thus, it is likely that the toe receives a larger impact. Moreover, since the movement of the toe is relatively larger than that of the other portion, a sense of fitting (sense of unity) is insufficient on the toe and an impact on the toe is not sufficiently absorbed.

SUMMARY OF THE INVENTION

The present invention was made in view of the aforementioned problems. It is an object of the present invention to provide footwear that can easily follow movement of a toe during walking and can sufficiently absorb an impact on the toe.

(1) Footwear according to a first aspect of the present invention comprises:

a pan member provided in a front part of a face of an outer sole of the footwear, the face being to be in contact with a sole of a foot, wherein

the pan member is provided with a shock absorber that comes into contact with a front part of the sole of the foot

to absorb an impact.

According to the above structure, the shock absorber can be stably located at a toe because the shock absorber is provided in the pan member.

Footwear according to a second aspect of the present invention comprises:

an upper leather and a shoe sole bonded at its upper portion to the upper leather, the upper leather being formed in a shape enclosing an instep of the foot and having a bottom opening rim closely resembling an outer shape of the sole of the foot, wherein

a pan member is bonded to a front part of the bottom opening rim of the upper leather so that a front part of the upper leather is formed in the shape of a bag to enclose a toe, and the pan member is provided with a shock absorber.

According to this structure, the pan member is bonded to the front part of the bottom opening rim of the upper leather so that the front part of the upper leather is formed in a shape of a bag to enclose the toe. Therefore, it is possible to improve following ability to the movement of the toe during walking. Moreover, the shock absorber can be stably located at the toe because the shock absorber is provided in the pan member.

(2) Footwear according to a third aspect of the present invention is the aforementioned footwear (the first or second

aspect) in which the shock absorber comprises a gel.

By forming the shock absorber with use of a gel, exhaustion of the shock absorber in which the shock absorber cannot recover from a compressed state because of long-term compression can be greatly reduced, unlike a shock absorber constituted by a sponge. Thus, exhaustion of the pan member caused by exhaustion of the shock absorber because of long-term use can be prevented, so that a large change of the width of the footwear cannot occur. In addition, a gel does not suffer hydrolysis caused by absorbed moisture such as sweat, unlike a sponge and therefore degradation of a shock-absorbing property caused by hydrolysis does not occur much.

(3) Footwear according to a fourth aspect of the present invention is the aforementioned footwear (any one of the first to third aspects) in which the shock absorber has an Asker F hardness of 30 or more and 90 or less.

This makes it possible to keep a sense of fitting between the toe and the footwear good and also possible to sufficiently absorb an impact on the toe. When the Asker F hardness is smaller than the above range, the shock absorber is too soft and degrades a shape-keeping property of the pan member. This may allow easy movement of the toe in the footwear, and may lose the sense of fitting. On the other hand, when the Asker F hardness exceeds the above range, the shock absorber is too hard and may prevent sufficient shock

absorption by the pan member.

(4) Footwear according to a fourth aspect of the present invention is the aforementioned footwear (any one of the first to fourth aspects) in which the shock absorber has an Asker F hardness of 30 or more and 90 or less and an Asker C hardness of 10 or more and 25 or less.

In this case, the shock absorber is felt to be hard to a certain extent when being pressed by an area approximately the same as a palm. Also, the shock absorber is felt to be soft when being pressed by an area approximately the same as a finger. Therefore, the shock absorber can firmly support the entire toe, and can softly support protruding portions of the toe, such as fingers, by changing its shape in accordance with the shapes of the protruding portions. Thus, it is possible to keep the sense of fitting better and it is also possible to sufficiently absorb an impact, especially on the protruding portions of the toe, such as fingers.

In other words, when the Asker F hardness falls within the above range, the sense of fitting between the toe and the footwear can be kept good, and the shock absorber can sufficiently absorb an impact on the toe like those in accordance with the fourth aspect.

When the Asker C hardness falls within the above range, the shock absorber can appropriately change its shape in accordance with the protruding portions of the toe, such as

fingers. Therefore, the sense of fitting and the shock absorbing property can be further improved. When the Asker C hardness is smaller than the above range, the shock absorber is too soft and allows the protruding portions of the wearer's toe to go down too deeply. This may lose the sense of fitting. On the other hand, when the Asker C hardness exceeds the above range, the change of the shape of the shock absorber in accordance with the protruding portions of the wearer's toe is not sufficient, although sufficient shock absorption can be achieved. Thus, further improvement of the sense of fitting is difficult.

(5) Footwear according to sixth and seventh aspects of the present invention is the aforementioned footwear in which each of the pan member and the shock absorber is formed to have a size with the length and width corresponding to those of a region of the sole of the foot from a tiptoe to a front end of an arch.

This makes it possible to absorb an impact on the entire front part of the sole of the foot more surely.

According to the first and second aspects of the present invention, the shock absorber can be stably located at the toe during walking. Thus, it is possible to surely absorb a large impact on the toe and greatly reduce fatigue, pains, and the like of the foot.

According to the third aspect of the invention, in

addition to the aforementioned effects, the sense of fitting (sense of unity) when a wearer wore the footwear for the first time can be permanently kept, and it is possible to absorb an impact on the toe permanently.

According to the fourth aspect of the invention, in addition to the aforementioned effects, the sense of fitting between the toe and the footwear can be kept good, and an impact on the toe can be sufficiently absorbed.

According to the fifth aspect of the invention, in addition to the aforementioned effects, it is possible to firmly support the entire toe. Moreover, it is possible to softly support the protruding portions of the toe, such as fingers, by changing the shape of the shock absorber in accordance with the protruding portions of the toe. Therefore, the sense of fitting can be kept better and an impact on the protruding portions of the toe, such as fingers, can be sufficiently absorbed.

According to the sixth and seventh aspects of the invention, the shock absorber can be more stably located at the toe during walking. Therefore, it is possible to surely absorb an impact on the front part of the sole of the foot and greatly reduce fatigue, pains, or the like of the foot.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of a shoe according to

an embodiment of the present invention;

Fig. 2 is an exploded perspective view of the shoe according to the embodiment of the present invention;

Fig. 3 is a plan view showing a state in which a pan member is stitched to a lining portion of the front part of an upper leather by French seam;

Fig. 4 is a perspective view showing an exemplary structure of the pan member;

Fig. 5 is a perspective view of another exemplary structure of the pan member; and

Fig. 6 is a cross-sectional view of a conventional shoe having a shock-absorbing property.

Description of Reference Numerals

1 Upper leather

2 Shoe sole

3 Pan member

11 Upper opening rim

12 Bottom opening rim

13 Outer material portion

14 Lining portion

21 Outer sole

22 Heel

23 Half midsole

30 Shock absorber

31 Gel

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

An embodiment of the present invention is now described with reference to the drawings.

As shown in Figs. 1 and 2, a shoe according to the embodiment of the present invention includes an upper leather 1 shaped in a shape enclosing the instep of a foot and a shoe sole 2 bonded at its upper portion to the upper leather 1.

The shoe sole 2 includes: a plate-like outer sole 21 having an outer shape that closely resembles the outer shape of the sole of the foot; a heel 22 in the form of a block provided at the heel portion of the back face of the outer sole 21; and a half midsole 23 in the form of a sheet bonded to the rear part of the upper surface of the outer sole 21. The heel 22 is formed separately from the outer sole 21 and is bonded to the outer sole 21 with glue, nails, and the like. However, the heel 22 may be formed integrally with the outer sole 21. The outer sole 21 and the heel 22 are formed of a synthetic resin, wood, or the like. The half midsole 23 has a size from the heel of the foot to the front end of the arch, and is bonded to the upper surface of the outer sole 21 by adhesion or sewing with a bottom opening rim 12 of the upper leather 1 caught between the half midsole 23 and the upper surface of the outer sole 21. The half midsole 23 is formed of

cloth, leather, or the like.

The upper leather 1 is a member formed by shaping natural leather or synthetic leather along the shape of the instep of a foot. The upper leather 1 includes an upper opening rim 11 for allowing a foot to be putting in the shoe in its upper part and a bottom opening rim 12 that closely resembles the outer shape of the sole of the foot in its lower part (see Fig. 2). In the front part of the bottom opening rim 12 of the upper leather 1, a pan member 3 in the form of a sheet is stitched by French seam. The front part of the upper leather 1 is formed in a shape of a bag to enclose a toe. More specifically, as shown in Fig. 3, the upper leather 1 is formed by an outer material portion 13 and a lining portion 14. The aforementioned pan member 3 is stitched at its outer peripheral edge to the outer peripheral edge of the lining portion 14. Thus, the pan member 3 comes into contact with a region of the sole of the foot from the toe to the front end of the arch.

As a shoemaking method in which the front part of the upper leather 1 is stitched by French seam, Bolognese method is known, for example.

The upper leather 1 having the above structure is bonded to the upper portion of the outer sole 21 with the bottom opening rim 12 pulled in. More specifically, the rear part of the bottom opening rim 12 of the upper leather 1 is glued or

sewed to the outer sole 21 with inwardly bent bonding margin being sandwiched between the outer peripheral edge of the outer sole 21 and the outer peripheral edge of the half midsole 23. The front part of the upper leather 1 is glued or sewed to the outer sole 21 at its bonding margin that has been formed by bending front leather inward, together with the lower surface of the pan member 3. Thus, the pan member is provided on the front part of the face of the outer sole of the footwear, the face being in contact with the sole of the foot.

As shown in Fig. 4, the pan member 3 stitched to the front part of the upper leather 1 by French seam is formed by: sandwiching a gel 31 between two fabric members 32 and 33 formed of a nonwoven fabric or the like; applying adhesive or the like to the peripheral portions of the two fabric members 32 and 33; and bonding them to each other. The two fabric members 32 and 33 have a size with the length and width corresponding to at least those of the region of the sole of the foot from the tiptoe to the front end of the arch. The gel 31 also has the size with the length and width corresponding to at least those of the region of the sole of the foot from the tiptoe to the front end of the arch. In other words, the two non woven fabric members 32 and 33 and the gel 31 have similar shapes, and the two nonwoven fabric members 32 and 33 are larger than the gel 31 by a size that ensures adhesion

margin or sewing margin in order to sandwich the gel 31 therebetween. The pan member 3 is provided with a shock absorber 30 achieved by the gel 31 and is formed to have a thickness of approximately 5 mm. Examples of the gel 31 include a member formed by a gel material sandwiched between two films (for example, one known as "U-NBC-45" manufactured by IIDA Industry Co., Ltd.).

A nonwoven fabric used for the fabric members 32 and 33 is fabricated by a spunbond method, a needle punch method, a melt-blow method, and the like. From a viewpoint of the strength of the fabric, it is preferable to use a nonwoven fabric fabricated by the melt-blow method.

Moreover, it is preferable that the nonwoven fabric member 32 be formed from a fabric that does not weaken the effect of the gel 31 and can keep a touch on the sole of the foot provided by that effect.

As the shock absorber 30 in the pan member 3, various materials having shock-absorbing properties such as a sponge and an elastomer can be used, other than the gel 31.

In addition, as shown in Fig. 5, it is preferable that the pan member 3 include stretchable films 34 for sandwiching the gel 31 therebetween. The film 34 is fabricated in a planar shape having the size that is approximately the same as that of the gel 31. The film 34 can preferably keep a touch on the sole of the foot provided by the effect of the gel 31, and for

example, is formed of polyester urethane.

On the other hand, as a result of repeated compression caused by application of the weight equal to or heavier than the wearer's weight during walking, the shock absorber 30 may be exhausted and may not recover from a compressed state. In this case, the pan member 3 is similarly exhausted. As a result, the width of the toe (width of the footwear) becomes larger. Moreover, exhaustion of the pan member 3 largely degrades its shock-absorbing property. Therefore, once the pan member 3 is exhausted, a sense of fitting on the toe (sense of unity) is lost, thus the shock-absorbing property is dramatically degraded. From such a viewpoint, as the shock absorber 30, the gel 31 is more preferable than a sponge, an elastomer, and the like.

That is, by forming the shock absorber 30 with use of the gel 31, exhaustion in which the shock absorber 30 cannot recover from a compressed state because of long-term compression is largely reduced, unlike a shock absorber constituted by a sponge. Therefore, the gel 31 is more advantageous than a sponge in recoverability (restoration property) against compression. Thus, the use of the gel 31 can prevent exhaustion of the pan member 3 caused by exhaustion of the shock absorber 30 because of long-term use. Also, the width of the footwear cannot be changed largely. Moreover, the gel 31 is advantageous in that it dose not suffer hydrolysis

caused by absorbed moisture such as sweat unlike a sponge and therefore degradation of the shock-absorbing property caused by hydrolysis of the gel 31 does not occur much. As a result, a sense of fitting on the toe when the wearer wears that shoe for the first time can be kept permanently, and the shock-absorbing property can be sufficiently shown.

The gel 31 constituting the above shock absorber 30 may preferably have an Asker F hardness (hardness measured when being pressed by an area approximately the same as a palm) of 30 or more and 90 or less, and an Asker C hardness of 10 or more and 25 or less is preferably used. The Asker F hardness is a hardness measured when an object to be measured is pressed by a wide area approximately the same as a palm. The Asker C hardness is a hardness measured when the object is pressed by a narrow area approximately the same as a finger. Both of the Asker F hardness and the Asker C harness are used for a standard of hardness for a rubber elastic material and the like.

Thus, the gel 31 is felt to be hard to a certain extent when being pressed by an area approximately the same as a palm. On the other hand, the gel 31 is felt to be soft when being pressed by a small area approximately the same as a finger. Therefore, the gel 31 can firmly support the entire toe, and can softly support protruding portions of the toe such as fingers by changing its shape in accordance with the shapes of

those protruding portions. Thus, the gel 31 can keep a sense of fitting better and can sufficiently show its shock absorbing property especially for the projecting portions of the toe such as fingers.

When the Asker F hardness falls within the aforementioned range, a sense of fitting between the toe and the shoe can be kept good and an impact on the toe can be sufficiently absorbed. In other words, when the Asker F hardness is smaller than the above range, the shock absorber 30 is too soft and degrades the shape-keeping property of the pan member 3. This may allow easy movement of the toe in the shoe and lose the sense of fitting. On the other hand, when the Asker F hardness exceeds the above range, the shock absorber 30 is hard and may prevent sufficient shock absorption by the pan member 3.

Moreover, when the Asker C hardness falls within the above range, the shock absorber 30 can change its shape appropriately in accordance with the protruding portions of the toe such as fingers. Therefore, the sense of fitting and the shock-absorbing property can be further improved. When the Asker C hardness is smaller than the above range, the shock absorber 30 is too soft and may cause the protruding portions to go down too deeply. This may lead to losing of the sense of fitting. On the other hand, when the Asker C hardness exceeds the above range, while an impact can be sufficiently absorbed, the change of the shape of the gel 31 in accordance with the

protruding portions of the toe is not sufficient. This prevents further improvement of the sense of fitting.

Examples of the material for the gel 31 include silicon resins, polyurethane resins, acrylamide gels, thermoplastic elastomers (such as styrene block copolymer; SBS, styrene-isoprene-styrene block copolymer; SIS), epoxy resins (containing plasticizer), starch-based gels (copolymer of acrylonitrile and acrylic acid). Considering abrasion resistance, tear strength, elongation, balance between viscosity and elasticity, and cost, polyurethane resins are preferable.

A polyurethane resin is formed from polyol, isocyanate, and the like.

Examples of the polyol include polyether-type polyols (polyoxypropylene glycol; PPG, polyethylene glycol; PEG, and polytetramethylene ether glycol; PTMEG), polyester-type polyols (adipate-type polyols, polycaprolactone, aromatic-type polyols, and polycarbonate-type polyols), polyolefin-type polyols, acryl-type polyols. Considering the cost and water resistance, polyether-type polyols are preferable.

Examples of the isocyanate include TDI (tolylene diisocyanate), MDI (diphenylmethane diisocyanate), HDI (hexamethylene diisocyanate), NDI (naphthalene diisocyanate), IPDI (isophorone diisocyanate), and denatured isocyanate of those materials. Considering the cost, easiness of handling,

and reaction stability, the use of tolylene diisocyanate is preferable.

A ratio of the polyol and the isocyanate determines the Asker F hardness. For example, in the case where polyoxypropylene glycol (PPG) having molecular weights of 2000 and 10000 is used as the polyol and tolylene diisocyanate based denatured isocyanate is used as the isocyanate, the following blending amounts are used.

According to the present invention, the polyol contains polyoxypropylene glycol (PPG) of molecular weight of 2000 and PPG of molecular weight of 10000 that are blended at a weight ratio of 1 : 1. Thus, the amount of each of PPG of molecular weight of 2000 and PPG of molecular weight of 10000 is 10 to 20 parts by weight, more preferably 12.5 parts by weight or more and 15 parts by weight or less. When the polyol contains PPG of molecular weight of 1000 in an amount of 20 parts by weight or less, the Asker F hardness exceeds 90 and sufficient shock absorption cannot be achieved. When the polyol contains that PPG in an amount of 40 parts by weight or more, the Asker F hardness is less than 30. Thus, the shock absorber is too soft and the shape-keeping property of the pan member is degraded.

When tolylene diisocyanate based denatured isocyanate (NCO% = 3%)is used as isocyanate, the blending ratio thereof is in a range of 35 to 50 parts by weight, more preferably, 40

parts by weight or more and 45 parts by weight or less.

When the blending ratio of the isocyanate is 50 parts by weight or more, the Asker F hardness exceeds 90 and the sufficient shock absorption cannot be achieved. When the blending ratio is 35 parts by weight or less, the Asker F hardness is less than 30. Thus, the shock absorber is too soft and the shape-keeping property of the pan member is degraded.

Polyurethane can be obtained by reacting polyol with isocyanate in the presence of a catalyst. Examples of the catalyst include amine type compounds and metal (nickel, tin, zinc, cadmium, magnesium, and mercury) compounds. Considering flexibility and control of the reaction, the use of metal compounds (e.g., a tin compound) is preferable.

It is preferable that the amount of the catalyst used be 0.1 to 1 parts by weight, provided the amount of polyurethane (polyol + isocyanate) is 100. This can provide hardening ability and durability within appropriate ranges.

The polyurethane resin may contain plasticizer. Examples of the plasticizer include aliphatic compounds, alicyclic compounds, and aromatic compounds (dibutyl phthalate, diheptyl phthalate, dioctyl phthalate, diisodecyl phthalate, ditridecyl phthalate, butylbenzyl phthalate, and butylphthalyl butylglycolate). Considering compatibility, the use of aromatic compounds is preferable. Particularly, the use of dibutyl phthalate is more preferable.

However, the polyurethane resin containing no plasticizer is the best. This is because the plasticizer migrates to the nonwoven fabric members 32 and 33 of the pan member 3 and degrades the function of the pan member 3. In the case of using a plasticizer, the pan member 3 is covered with a stretchable film that can prevent permeation of the plasticizer.

The used amount of the plasticizer is preferably 0 to 50 parts by weight, with respect to the amount of polyurethane (polyol + isocyanate) as 100. This makes it possible to set the Asker hardness within an appropriate range.

Polyurethane resin may contain colorants, age resistors (antioxidants, ultraviolet absorber, light stabilizer, hydrolysis inhibitor), antifoamers, flame retardants, and the like.

The shoe having the aforementioned structure can be fabricated in a similar manner to the conventional shoemaking method, and therefore only a brief description is made. First, the upper leather 1 is fabricated as follows. Leather as the material for the upper leather 1 is cut out in accordance with a predetermined pattern paper. The cut leather is shaped to fit to a wooden pattern having a shape of a foot. Then, the pan member 3 provided with a shock absorber 30, which has been prepared in advance, is stitched to the lining portion 14 in the front part of the bottom opening rim 12 by French seam in

such a manner that the front part of the bottom opening rim 12 forms a bag. Thus, fabrication of the upper leather 1 is finished. Next, bonding margin is formed by bending the bottom opening rim 12 of the upper leather 1 inward. Then, the upper leather 1 is placed on the upper portion of the outer sole 21 with the heel 22, which has been fabricated in advance by molding. The rear part of the upper leather 1 is glued, sewed, or the like, to the outer sole 21 with the bonding margin interposed between the outer peripheral edge of the outer sole 21 and the outer peripheral edge of the half midsole 23. The front part of the upper leather 1 is glued or sewed to the outer sole 21 at its bonding margin formed by bending the outer material portion 13 of the upper leather 1, together with the lower surface of the pan member 3. In this manner, the aforementioned shoe is completed.

As described above, according to the shoe of the above embodiment, the pan member 3 is bonded to the front part of the bottom opening rim 12 of the upper leather 1 and the front part of the upper leather 1 is formed in a shape of a bag to enclose a toe. Thus, following ability of the shoe to the movement of the toe during walking can be improved. Moreover, the shock absorber 30 having the length and width corresponding to those of the region of the sole of the foot from the tiptoe to the front end of the arch is provided in the pan member 3. Thus, the shock absorber 30 can be stably

located with respect to the toe, for example, the region from the tiptoe of the sole of the wearer's foot to the front end of the arch. Therefore, it is possible to surely absorb a large impact on the toe and greatly reduce fatigue or pains of the foot.

Moreover, by forming the shock absorber 30 with use of the gel 31, exhaustion of the shock absorber 30, in which the shock absorber 30 cannot recover from a compressed state because of long-term compression, does not occur much, unlike a shock absorber constituted by a sponge. Thus, exhaustion of the pan member 3 caused by the exhaustion of the shock absorber 30 because of long-term use can be prevented, so that a large size change of the footwear width does not occur much. In addition, the gel 31 does not suffer hydrolysis caused by absorbed moisture such as sweat, unlike a sponge and therefore degradation of a shock-absorbing property caused by hydrolysis does not occur much. Therefore, a sense of fitting when a wearer wears the shoes for the first time can be kept permanently, and an impact on the wearer's toe can be absorbed permanently.

In addition, by using the fabric member 32 formed of a nonwoven fabric or the like, the gel 31 does not come into contact directly with a sole of a foot. Moreover, by sandwiching a film 34 between the gel 31 and the nonwoven fabric member 32, permeation of the gel 31 through the fabric

member 32 can be prevented. Thus, in the case where the gel 31 was permeated, it is possible to prevent a wearer from feeling discomfort, for example, feeling that the sole of the foot is sticky because of the gel 31.

Furthermore, by selecting the material for the gel 31 as the shock absorber 30 so as to achieve the Asker F hardness of 30 or more and 90 or less and the Asker C hardness of 10 or more and 25 or less, the gel 31 can firmly support the entire toe, and can softly support the protruding portions of the toe, such as fingers, by changing its shape in accordance with those protruding portions. Thus, the sense of fitting can be kept better, and shock absorption can be sufficiently performed, especially for the protruding portions of the toe, such as fingers.

Next, a compression and recovery test was performed for a gel and a sponge. The test is generally described below.

<Samples>

(1) Gel (formed to have a thickness of 12 mm by stacking 3-mm-thick sheets of "U-NBC-45" manufactured by IIDA Industry Co., Ltd.)

(2) Sponge (formed to have a thickness of 12 mm by stacking 2-mm-thick sheets of "H-32" manufactured by Rogers Inoac Corporation)

<Test method>

For each sample, compression (5 hours) and release (1

hour) were repeated eight times. Then, after each sample was left as it was for 30 minutes, 24 hours, and 36 hours, a ratio of distortion of thickness (compression set (%)) was measured (see Table 1). The compression was performed to reduce the thickness of the sample to 1/4 (25%) of the original thickness.

【Table 1】

Time(h) / Compression set (%)	0.5(h)	24(h)	36(h)
Gel	8.0(%)	4.3(%)	2.7(%)
Sponge	30.0(%)	21.0(%)	11.5(%)

<Evaluation>

As is apparent from the above results, for both the gel and the sponge, compression set becomes smaller with the time. However, it was found that compression set of the gel was smaller than that of the sponge from the beginning of the release and therefore exhaustion of the gel was less than that of the sponge.

Values of hardness of the gel ("U-NBC-45" manufactured by IIDA Industry) and the sponge ("H-32" manufactured by Rogers Inoac Corporation) that have a thickness of 20 mm and were used in the above samples are as follows (see Table 2). The

values of hardness in Table 2 were measured by means of an Asker F hardness tester and an Asker C hardness tester.

【Table 2】

	Asker F hardness	Asker C hardness
Gel	85	17
Sponge	78	40

The above gel and the above sponge satisfy the condition in which the Asker F hardness is in a range of from 30 to 90. Therefore, both the above gel and the above sponge can keep a sense of fitting between a wearer's toe and a shoe good and can sufficiently absorb an impact on the toe.

On the other hand, the above gel also satisfies the condition in which the Asker C hardness is in a range of from 10 to 25. Therefore, the gel can firmly support the entire toe, and can softly support protruding portions of the toe, such as fingers, by changing its shape in accordance with the protruding portions. Thus, the gel can keep the sense of fitting better and can sufficiently absorb an impact especially on the protruding portions of the toe, such as fingers.

In the above embodiment, a pair of pumps provided with heels is described as an example. However, the present

invention may be applied to a pair of boots or shoes with no heels. Moreover, the present invention may be applied to any of ladies' shoes and men's shoes. In addition, the present invention may be applied not only to formal shoes but also to various sports shoes such as jogging shoes. Furthermore, the present invention may be applied to footwear such as sandals or slippers. The materials for the upper leather 1 and the outer sole 2 are not limited to the materials described above. Various materials can be used.